Response to written opinion

To: Director-General of the Patent Office

1.International application No.

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2.Applicant

SEIKO INSTRUMENTS INC.

8, Nakase 1-chome, Mihama-ku, Chiba-shi

Chiba 261-8507 JAPAN

3.Attorney

HAYASHI Keinosuke

1493, Sendabori, Matsudo-shi,

Chiba 270-2252 JAPAN

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5. Contents of reply

We submit a written amendment together with this written reply, and clarify features of the present application invention. We firmly believe that the judgment of an inventive step in the written opinion is reversed.

The following explanation will be made on the basis of this.

(1) Cited references

Reference 1 (Japanese Patent Laid-Open No. 38926/1983) discloses that a plastic substrate with an orientation film of a roll shape is formed by coating (roll-coating or spraying) a transparent plastic film substrate continuously wound with the solution of an orientation agent (a vertical orientation agent and a horizontal orientation agent), and is cut in a unit of the

substrate so that a substrate for a liquid crystal cell is made.

Reference 2 (Japanese Patent Laid-Open No. 2019/1988) discloses that a polarizing filter, a color filter, a transparent electrode and an orientation film are continuously laminated and formed on a plastic film substrate of a long belt shape, and orientation processing for performing rubbing in a longitudinal direction of the plastic film substrate of a long belt shape is performed. Here, an individual display element is slantingly arranged on the film substrate to set an orientation direction to the longitudinal direction.

Reference 3 (Japanese Patent Laid-Open No. 211468/1997) discloses a manufacturing method in which a vertical orientation material is formed on the substrate surface, and vertical orientation (giving a pretilt angle) is performed by irradiating an ultraviolet ray to this vertical orientation material from a direction inclined from a surface normal line.

(2) Explanation of the present application invention

As described in the written amendment simultaneously submitted together with this written reply, the features of the present application invention reside in "a manufacturing method of a liquid crystal display unit having a pair of polymeric substrates each forming a transparent electrode pattern, and a liquid crystal layer arranged in a clearance formed by opposing said pair of polymeric substrates to each other;

the manufacturing method comprising a patterning process for forming many transparent electrode patterns in a longitudinal

direction in a first polymeric substrate having a longitudinal length longer than a transversal width; a vertical orientation film forming process for forming a vertical orientation film in said first polymeric substrate; an orientation process for prescribing the falling direction of a liquid crystal molecule of said liquid crystal layer while said first polymeric substrate is continuously moved in the longitudinal direction; a patterning process for forming many transparent electrode patterns in a longitudinal direction in a second polymeric substrate having a longitudinal length longer than a transversal width; a vertical orientation film forming process for forming a vertical orientation film in said second polymeric substrate; an orientation process for prescribing the falling direction of the liquid crystal molecule of said liquid crystal layer while said second polymeric substrate is continuously moved in the longitudinal direction; a process for opposing and sticking said first and second polymeric substrates of an elongated shape; and a process for arranging a liquid crystal of negative dielectric anisotropy in the clearance formed by opposing said first and second polymeric substrates".

Such a manufacturing method has notable operations and effects described in the specification in which the liquid crystal display unit using the polymeric substrate can be simply manufactured at low cost with high productivity.

Namely, it is sufficient to set the orientation direction to a direction (generally a direction parallel to a moving direction

of the elongated polymeric substrate) parallel to a phase advancing axis or a phase delaying axis of optical anisotropy of the polymeric substrate at any time by using a method for forming the vertical orientation film in the elongated polymeric substrate in any view angle characteristics required in the liquid crystal display unit. Accordingly, it is not necessary to change the orientation direction in accordance with the specification of the display unit. With respect to another opposed polymeric substrate, it is similarly sufficient to set the orientation direction to a direction parallel to the phase advancing axis or the phase delaying axis of optical anisotropy of the polymeric substrate at any time irrespective of the characteristic specification of the liquid crystal display unit. Accordingly, when the present application invention is used, it is easily possible to assemble upper and lower substrates such that the orientation directions of the upper and lower substrates are opposed to each other while the elongated substrates are used as they are. Therefore, the liquid crystal display unit of the polymeric substrate can be manufactured with high productivity.

(3) Comparison of the present application invention and the cited references

The present application invention and the invention described in the cited reference 1 are in conformity with each other in that the orientation agent (the vertical orientation agent and the horizontal orientation agent) is formed on the

transparent plastic film substrate continuously wound. However, the cited reference 1 simply discloses only formation of the vertical orientation film, and has no description suggesting that the orientation direction can be set to a direction parallel to the longitudinal direction of the elongated film substrate irrespective of the characteristic specification of the display unit by applying the vertical orientation film to the liquid crystal display unit having the film substrate, and the display unit can be formed by opposing two elongated film substrates formed in this way.

The present application invention and the invention described in the cited reference 2 are similar to each other in that the orientation film is continuously formed on the plastic film substrate of a long belt shape, and orientation processing for performing rubbing in the longitudinal direction of the plastic film substrate of a long belt shape is performed. However, in the cited reference 2, the individual display element is slantingly arranged on the film substrate (so as to have an angle) to set the orientation direction to the longitudinal direction. If the display element is similarly laid out on an opposite substrate in conformity with a required orientation angle, the elongated substrate can be continuously moved until the orientation process. However, it is impossible to oppositely stick the film substrates in the elongated shape as it is unless a specific very limited combination relation is formed in the orientation directions of the upper and lower substrates. Further, the characteristic

specification required in the liquid crystal display unit is generally various and diverse, and the orientation direction (more particularly, characteristics, distortion angle, view angle direction, etc. of the used liquid crystal) is changed in accordance with the specification. Therefore, it is necessary to change the pattern layout of the display element on the elongated film substrate every specification. Namely, it is substantially impossible to form the display unit by sticking the elongated film substrates to each other in the manufacturing method in the cited reference 2.

The present application invention and the invention described in the cited reference 3 are in conformity with each other in that the vertical orientation film is used in the orientation film of the liquid crystal display unit. However, the cited reference 3 simply discloses that the vertical orientation film is orientated by irradiating an ultraviolet ray in a direction inclined from the surface normal line of an orientation film face (a pretilt is provided). Accordingly, the cited reference 3 has no description suggesting a technical idea in which a display element can be formed by sticking two elongated film substrates by applying such a vertical orientation film to the manufacturing method of the liquid crystal display unit using the elongated film substrate.

The present application invention is characterized in that the display element can be formed by sticking the two elongated

film substrates by utilizing that it is sufficient to set the orientation direction to a constant direction (a direction parallel to the phase advancing axis or the phase delaying axis of optical anisotropy of the polymeric substrate) irrespective of the specification of the display element by using the vertical orientation film when the liquid crystal display unit is manufactured by using the elongated polymeric substrate.

In contrast to this, in each cited reference, there is no description of the object of "the provision of a manufacturing method of the liquid crystal display unit using the polymeric substrate with high productivity by realizing a construction and a method able to form the display element by sticking the two elongated film substrates to each other" in the present application invention. Further, there is no description suggesting a technical idea of utilizing the vertical orientation film to realize this object.

(4)

Thus, in each cited reference, individual elements of the present application invention are fragmentarily disclosed, but there is no description suggesting a technical idea in which the orientation direction is set to be parallel to the phase advancing axis or the phase delaying axis of optical anisotropy of the polymeric substrate by using the vertical orientation film in the orientation film to realize that the display element is formed by sticking the two elongated polymeric substrates to each other.

Namely, each cited reference simply discloses only the

individual elements of the present application invention, and has no suggestion of the above excellent operations and effects obtained when these individual elements are combined with each other. Namely, the technical idea of each cited reference is entirely different from that of the present application invention, and each cited reference does not suggest the technical idea of the present application invention. Accordingly, no present application invention can be made even when such cited references are combined.

(5) Conclusion

As mentioned above, no present application invention can be made by simply combining the inventions described in the respective cited references with each other.